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THE EVOLUTION OF ANÆSTHESIA IN MANCHESTER, 1900—1945

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AT the first meeting of the Manchester and District Society of Anæsthetists, a short paper on the evolution of anæsthesia from the beginning of the century seemed a fitting subject with which to open the proceedings, not only *pour encourager les autres,* but also to show the younger members of the Society that there had been changes, and that the inheritance upon which they were about to enter was a richer and fuller one than any to which we had succeeded. Dr. Blomfield thought a modified version might be of interest to a larger audience and so here it is.

There have been five major changes in anæsthesia during this period. They are:

1. Premedication with its extensions, basal anæsthesia and the intravenous use of barbiturates.
2. Oxygen, the general use of.
3. Spinal Anæsthesia, the increasing use of.
4. Magill's tube.
5. Mechanization.

We are too close to curare and cyclopropane, to electrical and refrigeration anæsthesia, to be sure that they can rightly be classed as coming under the heading of "Major Developments". Cyclopropane and curare are merely new drugs with some advantages and some disadvantages, electrical anæsthesia and refrigeration are certainly new methods but not yet sufficiently

established. They may come under the heading of "Major Developments" in the next fifty years.

Well, let us take a peep into an operating theatre any time between 1900 and 1907. What shall we see? Alexander Wilson will be there with a Clover's ether inhaler in hand. Often he blew up the bag himself, more artfully he caught the patient's expiration whilst letting him inspire from the air around. When the bag was three-quarters full the mask was fitted closely to the patient's face, and the pointer turned to mark one, and so gradually to mark four. As the result of the conservation of the patient's expirations, the breathing deepened and the complexion, if originally rosy, rapidly changed to a deep plum colour. The ether meanwhile had caused a copious secretion of mucus and saliva which added to the congestion, and a halt had to be called for mopping-up operations. A gag was inserted into the mouth and a towel was used to absorb and remove as much of the secretion as possible, at the same time the patient had recovered his original colour owing to the entrance of air. The proceedings were repeated as often as necessary. It was a fairly quick method of getting the patient under, the accumulating CO_2 forcing the patient to breathe deeply. It was this deep breathing that many operators objected to as it hampered their intra-abdominal manipulations and so they insisted on $CHCl_3$. The giving of $CHCl_3$ on lint to a patient for an abdominal section is a method of anæsthetizing calling for more skill than any other before or since. Vernon Harcourt had introduced his inhaler to the Society of Anæsthetists as early as 1903, but it was a number of years later before it appeared in Manchester. There can be no doubt that it was of great service in helping to carry out a prolonged operation under $CHCl_3$. The regulation of the dose gave one at least one certain factor, and in a situation full of uncertainties, it is a comfort to know something for certain. Most of our younger members will never have seen a Vernon Harcourt till to-night and though

we no longer use it regularly, it is a good way to anæsthetize for a radical breast operation, if the surgeon expresses a wish for $CHCl_3$ as he not infrequently does. From personal experience I can strongly recommend its use in obstetrics. The inhaler is tied to the head of the bed, the pointer set to 1 per cent, the mask handed to the patient, who is told to fit it to her face and when she feels a pain coming on to take two or three deep breaths. Such patients are very apt pupils. The edge of every pain is blunted and if unconsciousness supervenes the mask falls off. The obstetrician is aware of what is going on as he can hear the click of the valves. If deep anæsthesia is required it is easy for the nurse to hold the mask on the face and the click of the valves tells the doctor that all is going well. About this time also we first came across the Roth-Drager apparatus and this was really an epoch-making advance, in that it required the use of oxygen. The actual apparatus did not survive long. It is hardly possible for any apparatus when used by all and sundry to keep in usable condition for a reasonable length of time. But we had realized the benefit of oxygen and from then on oxygen cylinders have been available in all theatres. It was while using this machine that I saw my first death on the table. The patient was diagnosed as suffering from a malignant growth of the thyroid. In his endeavours to remove it, an heroic operation for those days, the surgeon pulled on the tissues of the neck and the patient stopped breathing, a little artificial respiration restored natural respiration and the operation continued. More traction on the tissues of the neck stopped the heart this time. Death was said to have been accelerated by the giving of an anæsthetic. It would have been more correct to say that the anæsthetic had been unable to prevent a death which was so obviously caused by the surgeon. Consideration of this case led me to give morphia and atropine as a preliminary injection. The atropine in order to prevent vagus inhibition of the heart and the morphia as a sedative to nervous patients, to put them in a

more favourable state for the undergoing of an operation. In the light of subsequent experience I have no hesitation in saying that this also was a very definite milestone on the road of progress in anæsthesia. Twenty years later Ross Mackenzie of Aberdeen in a paper in the *Brit. Journ. of Anæsthesia* used these words, "Apart from the anæsthetic itself there is no single factor in anæsthesia that has afforded the surgical patient more physical and mental benefit and protection than the introduction of the preliminary injection of morphine and atropine or the equivalent."

You who would never dream of anæsthetizing a patient without a preliminary dose of atropine at least can scarcely realize what a tremendous innovation this preliminary injection of morphia and atropine was. You will, if you try and anæsthetize the next two or three of your patients with ether without any premedication. About a year later a Liverpool surgeon visited America and came back an enthusiast for open ether. We went to see him operate under open ether and found that he used atropine but not morphia as premedication. Subsequent experience seemed to teach us that atropine alone prevents 75 per cent of the post-anæsthetic vomiting to which we had been hitherto accustomed, and though the addition of morphia did nothing to enhance this effect, if anything there was slightly more vomiting, the soothing effect on the mind of the patient was of inestimable benefit. We found that open ether was slow as compared with the Clover and so anæsthetists began to cover up their patients with gauze or gamgee tissue so as to conserve at least some of the CO_2, a partial return to the Clover idea.

The next change, I am in doubt if we should call it an advance, came in the form of "Basal anæsthesia". Basal anæsthesia was first practised some hundred years ago, but scarcely became often used till Gwathmey introduced his ether oil rectal injection and not fashionable till avertin came in from Germany.

A Manchester surgeon visiting that country in 1937 was told by a distinguished Berlin professor that the reason they employed it in Germany, though a bad method, was due to the dearth of competent anæsthetists. The implication of that remark will not be lost on you. If there be any sense in chemistry, and if as usually accepted $CHCl_3$ is dangerous because of its halogen content, then I cannot see why avertin is not more dangerous because it contains a more poisonous halogen in approximately equal amount. Deaths following the administration of avertin for which no other cause could be advanced have been reported. Langton Hewer mentions a case of severe vomiting and acidosis following avertin, gas and oxygen. Acute yellow atrophy and ventricular fibrillation, this latter with adrenalin, have been reported in animal experiments. It appears then that it has much the same action as $CHCl_3$ as one might expect from its chemistry. The difference in the method of giving $CHCl_3$ and avertin is in favour of the former as that is stopped slightly before the end of the operation whereas it is obvious that the avertin continues to act for some time after the operation is finished. Paraldehyde, recognized by most authors as the safest basal, is unpopular because of its smell and because it is more exacting on the nursing staff; albeit the sister who has had the longest experience of it prefers it to avertin. Its lethal dose is in the neighbourhood of eight times that of its therapeutic dose whereas that of avertin is about two to one. Both evipan and pentothal can be given per rectum but it is not so easy to estimate the correct dose for the particular patient. The combination of latex with evipan and ether has been warmly recommended by Gwathmey and others. The few trials I made of it scarcely warranted the enthusiasm expressed by Gwathmey, but they were too few upon which to base any opinion. The preparation of the latex, the individual attention necessary and the way we have been circumstanced these last few years have proved too much for me to make an extended trial of the method, but I

think it has possibilities which are worth further examination. Whether then we are to regard basal anæsthesia as a mere pandering to a soft and indulgent public, the trump card of the surgeon to persuade a reluctant patient to undergo an operation, the last refuge of the incompetent anæsthetist, or a real advance which protects the balance of the mind from disintegrating shock, prevents the occurrence of bronchitis or pulmonary collapse and the distress of post-operative vomiting is perhaps for the future to determine. In the meantime it is a very pleasant way through the ordeal of an operation. Avertin is much less used now than it was some years ago.

The visit of Dr. Pitkin about 1928 gave a great stimulus to spinal anæsthesia. I gave my first spinal in 1912 but there was little call for this method until Mr. Burgess took the matter up with his customary enthusiasm. His encouragement and patience were solely responsible for giving me the opportunity of extensive experience in the method. Very early on I found that everybody agreed that when the anæsthetic went too high we were in the presence of danger if not disaster. There, however, agreement ended. At least half a dozen different theories were advanced as to the cause of the fatal issue. Thus the physiologist said respiration was paralysed but could not explain why artificial respiration was not always an effective remedy. Observers from Boston said respiration was not paralysed but did not explain why death occurred. From Canada we heard that the phrenics were paralysed but the respiratory centre was not. Some Frenchmen said " C'est le moteur cardiaque qui est frappé ". The late Dr. Howard Jones suggested that the anæsthetic was absorbed into the blood stream and there paralysed the V.M. centre. Many gave their opinion that it was due to a fall of blood-pressure, and Labat thought that a fall of blood-pressure was of no moment provided the patient was at once put into a definite Trendelenburg position. A fine set of opinions with which to pass an examination but completely bewildering

when face to face with an emergency. A series of experiments at the University enabled us to sift the wheat from the chaff and so to bring a confidence and an assurance into the work which was a great comfort in time of trouble. Spinal anæsthesia is probably the best method of anæsthetizing patients for whom the method is suitable. It is a method for the expert and for those of great clinical experience, the more the better. It is not popular with anæsthetists for the very obvious reason that the responsibility is great and immediate and one is dealing with a living conscious human being who makes greater demands on one than an unconscious mass of snoring protoplasm. Speaking of certain grave risk cases Drs. Forgue and Basset say, "Toute intervention les menace; toute anesthésie risque de rompre, en quarante-huit heures, cet équilibre très instable. Toute compte fait, il vaux mieux alors anesthésier ces malades a l'éther, à méthode ouverte, au goutte à goutte sur la compresse; le risque est moindre, et *la responsabilité moins immédiate.*" The French express things so nicely. Complications are rare, the commonest is headache, very occasionally this is severe.

The secret of all general anæsthesia is the keeping of an open air-way, therefore when Magill introduced his tube not only into the trachea but also to the medical profession it was a notable advance. Once this tube is in position through the nose and into the larynx most patients will anæsthetize themselves if connected with a suitable apparatus. Of these there are many on the market, not all of them suitable, but all very expensive. Their most important contribution has been to enable us to use the closed circuit technique.

During this period $CHCl_3$ has been on the decline. It is still of immense help in some difficult situations, better than anything else, as one would expect it to be as the most powerful anæsthetic we have. All the older anæsthetists use it. It may come again, it seems to be the way of the world, for is not every valley exalted and every mountain and hill made low?

INFILTRATION ANÆSTHESIA OF THE LOWER ARM AND HAND

By Dr. L. Tauber

IN the treatment of surgical diseases of the upper extremity, partly local and partly general anæsthesia are used. The opinion of Kochert, that local anæsthesia is advisable only when contra-indication of narcosis exists, is no longer accepted. We cannot lay down any general rule as to the best types of anæsthesia to be applied, for example, the age of the patient or his psychic disposition has often induced us to complete under narcosis an operation which is normally carried out by employing only local anæsthesia. On the other hand, it may happen that the patient's fear of narcosis is so great that in order to avoid it he is ready to bear even considerable pain. However, whatever the method the surgeon employs, his aim is always to carry out the operation with the minimum of pain. This can only be achieved through the choice of drugs of the appropriate kind and quantity and through the use of correct methods correctly applied.

The oldest, as well as the best known methods of analgesia, employed in surgical treatments of the upper extremity, are the two evolved by Oberst and Kullenkampff. The first of these, though simple, is not in all cases without danger, as we shall see later. The second, besides requiring specialized technical skill, also leads in a certain number of cases, not only to unpleasant symptoms such as paralysis of the cervical sympathetic system, blocking of the phrenic nerve and pain in the chest, but also to serious collapse, pneumothorax and even death. On account of these dangers, these methods can certainly not be employed for ambulant cases.

In the last century, Korning and Goldscheiner investigated the problem of infiltrative anæsthesia. In animal experiments,

they succeeded by the injection of anæsthetic solutions into the prepared nerve (i.e. by endoneural injection) in making the area supplied by the nerve completely insensitive. Soon they were able to demonstrate that analgesia could also be obtained, though more slowly, by perineural injection, that is, by allowing the anæsthetic fluid to reach the immediate surroundings. By systematic investigations, they also showed that the nearer this injection is to the site of operation the smaller the actual amount of solution required.

Endoneural methods of peripheral infiltration anæsthesia can be used with complete success, only when the nerve passes over bone or lies within a bony canal; for example, the brachial plexus as it lies on the first rib, the ulnar nerve on the humerus or the infraorbital nerve in the infraorbital canal. According to Braun, among the nerves of the upper limb, only the ulnar nerve in its groove can be anæsthetized in this way (after Krogius). Wiedkopf advocated the analgesia of radial and median nerves also, at the elbow and above the elbow, respectively. The localization of these nerves, however, is made difficult through the lack of definite bony landmarks and so these methods could not become popular. Although above the wrist there is still no sure bony guide to these nerves, anæsthesia in this region is more often performed.

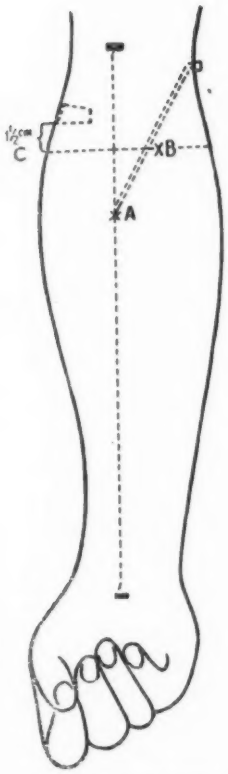
The inadequacy of peripheral infiltration anæsthesia in the upper limb led me to investigate further these two nerves. Dissection showed that suitable sites for nerve puncture of the radial and median nerves exist also. They are found as follows:

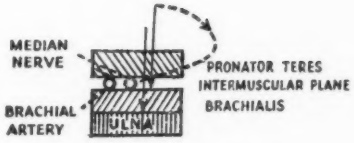
By the movements of pronation and supination of the lower arm the head of the radius is easily defined. One and a half centimetres below this, a line is drawn perpendicular to the long axis of the arm. In position of supination, from the junction of the thenar and hypothenar eminences, a line is drawn at right angles to the former. The radial nerve lies at a depth of about one and a half centimetres, directly on the bone, below the point

of intersection of these two lines and can be reached by a perpendicular thrust of the needle. In the case of a successful nerve puncture, the patient experiences an electric sensation; if this reaction does not occur the nerve will be found by deviating the needle a few millimetres from the perpendicular. The location of the median nerve is not quite as simple, but with a little practice it too can be anæsthetized. The method is as follows:

By pronation and supination, the lateral border of the Pronator Teres is defined. Half a centimetre medial to this (thus avoiding injury to the brachial artery), level with the lateral epicondyle, the ulna can be reached by a perpendicular puncture of the Pronator Teres and Brachialis muscles. The median nerve lies in the space between the two muscles. As long as the needle is piercing both muscles, it cannot be moved from side to side. By carefully withdrawing the needle, a certain depth will be reached at which, for the first time, its free movement will be possible. This level corresponds to the intermuscular plane. Here the needle is turned at an angle of almost 180 degrees and pushed carefully in a lateral direction, until a resistance is felt, which is caused by the median nerve. In both cases, 5 to 10 cubic centimetres of 2 per cent novocain are injected after a successful nerve puncture.

I have had the opportunity of testing the technique described above on twenty patients, two with fractures of the radius and eighteen cases of panaritium of the hands with definite lymphangitis. In all cases, in twenty to twenty-five minutes, the whole area innervated by the nerves was made completely insensitive and all motor impulses were blocked. The area was definitely hyperæmic as a result of paralysis of all the vasoconstrictor and vasodilator fibres. In one case, though the sensory function of the radial nerve was eliminated, the motor functions remained unimpaired. The effect lasted about one and a half hours. As the cutaneous nerves can easily be anæsthetized by simple subcutaneous circular infiltration, complete insensitivity of the





whole lower arm and hand can be achieved without the infiltration of the brachial plexus.

Indication. In all those cases of finger panaritia, where an accompanying lymphangitis reaches the first phalanx, Oberst's infiltration method cannot be used. Should the patient have also myocardiac lesions, a contraindication of narcosis also exists. At our present stage of knowledge, the only possible alternatives would be freezing or Kullenkampff's anæsthesia. Freezing is the simplest form of analgesia, though probably few patients who have suffered from this method would consider that

it deserves the name anæsthesia. The latter is a complicated procedure and can be dangerous as explained before. It is also contraindicated in cases of pulmonary tuberculosis, emphysema, that is, in those diseases where narcosis is also out of the question. It is then evident that in these patients, the infiltration anæsthesia of the lower arm is the only possible method. In Oberst's method, the locally administered solution causes a mechanical compression of the vessels. In advanced cases of pyogenic processes of the finger, especially if arteriosclerosis or diabetes is also present, this mechanical compression may lead to irreparable damage, by gangrene setting in. In the infiltration anæsthesia of the lower arm, this danger does not arise, for the fluid is applied at some distance from the site of the operation and, furthermore, is accompanied by extreme vasodilation. In closed fractures the simple local anæsthesia is excellent, but in serious injuries and open fractures the infiltration anæsthesia of the lower arm can again well be employed. According to Cryle, intraneural injection of novocain also diminishes the shock.

Summary. With the infiltration anæsthesia technique of the lower arm, a new indication can be established and the complications of narcosis can be avoided. It is indicated in all those surgical diseases of the lower arm and hand, where the more dangerous and complicated Kullenkampff method or general anæsthesia are not desirable.

THE PERMANENTLY PATENT (P.P.) INTRAVENOUS NEEDLE.

By Emily E. Johnson, M.B., Ch.B., D.A.

Consulting Anæsthetist to the E.M.S., West Riding County Hospitals, Clayton Hospital, Wakefield, and Dewsbury General Infirmary

EVERY one with experience in intravenous therapy or intravenous anæsthesia realizes that the two great difficulties are:

1. Keeping the needle in the vein.
2. Keeping the needle patent.

Methods now in use to obviate these difficulties are:

a. The tying of a cannula into a vein.

b. The use of a wide bore needle.

c. A drip feed.

d. A pressure drip feed.

After much dissatisfaction with the above methods, I have now devised a stiletted intravenous needle which, fixed in the manner to be described, stays in the vein and remains patent for any length of time.

The needle used is stiletted needle (stainless steel), two inches in length, 45 degrees bevel point, with a pin in the head of the stilette which fits into a notch in the hub of the needle. It is made in various gauges from 23 to 17.

A new type of strapping is used here, "Durex Cellulose Adhesive Tape", which has the following advantages. It is quite transparent, tough, very adhesive and does not leave any glutinous residue on removal.

Method of Use.

1. Prepare lengths of cellulose adhesive tape and fold them over at one end to make for speedy removal. Three lengths should be 4–5 inches long and a fourth should be of such a length that it completely encircles the arm and overlaps for 2–3 inches. The use of transparent strapping ensures visibility.

2. Introduce the needle into the vein with stilette in situ and the notch in the needle facing upwards in order to facilitate reintroduction of the stilette. When the needle is in position in the vein, gently withdraw the stilette and blood will flow.

3. Pressure on the arm is gradually relaxed and the stilette reinserted.

4. Fix the needle in position thus:

Infold the vein by drawing together folds of skin from each side and fix in position by one of the short lengths of cellulose tape. A second similar piece may be necessary to fix the overlapping folds of skin in position. These overlapping folds of skin should extend about ½ inch beyond the tip of the needle and about 1 inch down its length. Another short piece of strapping is placed over the lower inch of needle, thus fixing it directly to the skin. It will be noted that only the hub of the needle is free from strapping.

5. Remove the stilette to ensure that the needle is still in the vein (as the vein is not now distended it will take a few seconds for blood to appear) and reinsert the stilette.

6. Apply the long piece of strapping over the needle, completely surrounding the arm and overlapping for 2–3 inches.

N.B. The above operation should take 1–2 minutes (except where finding a suitable vein presents difficulties).

The needle is now in position and ready for the introduction of any drug or fluid. The arm is then placed on an arm board covered with a sterile towel and the wrist fastened to it by a strap or bandage.

Special Advantages.

1. The use of transparent cellulose strapping permits visibility and thus minimizes the risk of not noticing a dislodgement of the needle. Further it has the advantage of not leaving any glutinous material adherent to either skin or needle on removal.

2. The 45 degree bevel aids venipuncture.

3. When the needle is fixed in the manner described the vein will not be punctured by any movement caused by the attachment of syringes, etc.

4. The fine bore minimizes trauma.

5. The additional length of the needle facilitates its fixation to the skin.

6. No cumbersome intravenous apparatus is necessary requiring numerous assistants to transport the patient from anæsthetic room to theatre.

Special Uses.

1. The easy giving of fractional doses of any drug or antidote, by the intravenous route.

2. The rapid attaching of any intravenous drip.

Method of Giving Intravenous Drugs or Fluids.

1. Remove stilette and place on a sterile towel or swab.

2. Using record syringe inject drug or fluid.

3. Immediately replace the stilette.

It should be noted that a further injection may be given with an ensured patent needle still in position irrespective of the time interval. At the end of the operation the needle may be withdrawn (alternatively a post-operative intravenous drip may be attached), care being taken that the strapping over the infolded vein is left in place, thus ensuring the asceptic healing of the venipuncture. Pressure should be applied over the cellulose tape for a minute or two at the site of venipuncture immediately after removal of the needle to prevent any oozing of blood.

Points Worth Noting

The p.p. needle is particularly useful for giving:

1. Fractional doses of pentothal.
2. Tubarine.

Here, it is advisable to note the following facts concerning tubarine administration.

Three syringes must be prepared as follows:

A 5 c.c. for tubarine either undiluted or to give more accurate control diluted with sterile distilled water or N. saline (thus 1 c.c. contains 3 mgm.).

A 10 c.c. for sterile distilled water or N. saline.

A 20 c.c. for pentothal.

The reason for using different sizes of syringes is to provide easy identification and to minimize the danger of giving the wrong solution. In the event of using syringes of a similar size, different coloured tapes or named tapes should be attached to each particular syringe. The stilette must now be withdrawn from the needle and the original dose of pentothal given immediately followed by a few c.c. of N. saline.

N.B. The N. saline must be used to prevent the formation of a precipitate by the interaction of pentothal and tubarine.

The stilette is replaced, after which nitrous oxide-oxygen anæsthesia may be commenced if desired.

The patient is now ready for operative procedures.

At the necessary moment the stilette is withdrawn and the calculated dose of tubarine injected, followed by a few c.c. of sterile distilled water or saline. Should any further pentothal, tubarine, or antidote be deemed necessary these can be administered with complete immunity from precipitation if the routine of giving sterile distilled water or saline following each drug is adhered to. Further it assures that the drugs are completely in the circulatory system.

In every major surgical procedure whatever type of anæsthesia

be chosen, the p.p. needle in a vein may prove to be a life-saving factor. It is immediately ready for any cardiac or respiratory stimulant, the introduction of pentothal for ether convulsions or for the attaching of an intravenous drip. As an intravenous drip may be dislodged in transport from ward to theatre, the p.p. needle with stilette in situ makes possible the detaching of the drip before transport is commenced. This means that the patient is without a drip for the few minutes of transportation but this disadvantage is more than offset by the p.p. needle being available to the patient for the drip immediately on arrival in the theatre.

These permanently patent (p.p.) intravenous needles are made by Messrs. Chas. F. Thackray, of Park Street, Leeds, and the " Durex Cellulose Adhesive Tape " by Durex Abrasives Ltd., Arben Road, Adderley Park, Birmingham.

MUSEUM OF ANÆSTHESIA ESTABLISHED IN AUSTRALIA

By Len Barker

Photographs by Ken Dicker

THE Australian Society of Anæsthetists has established the third museum of anæsthesia in the world at Melbourne. The only other known museums of its kind are in New York and London.

Situated in the University of Melbourne, the museum was opened on October 16, 1946, coinciding with the centenary of the first successful public demonstration of a general anæsthetic.

Far from being an exhibition of relics it is a modern school of instruction where the history of anæsthesia is traced for the benefit of medical and dental practitioners and students of those subjects at the University of Melbourne.

The Society of Anæsthetists (which has a membership of 100) hopes through the museum to establish the following primary functions:

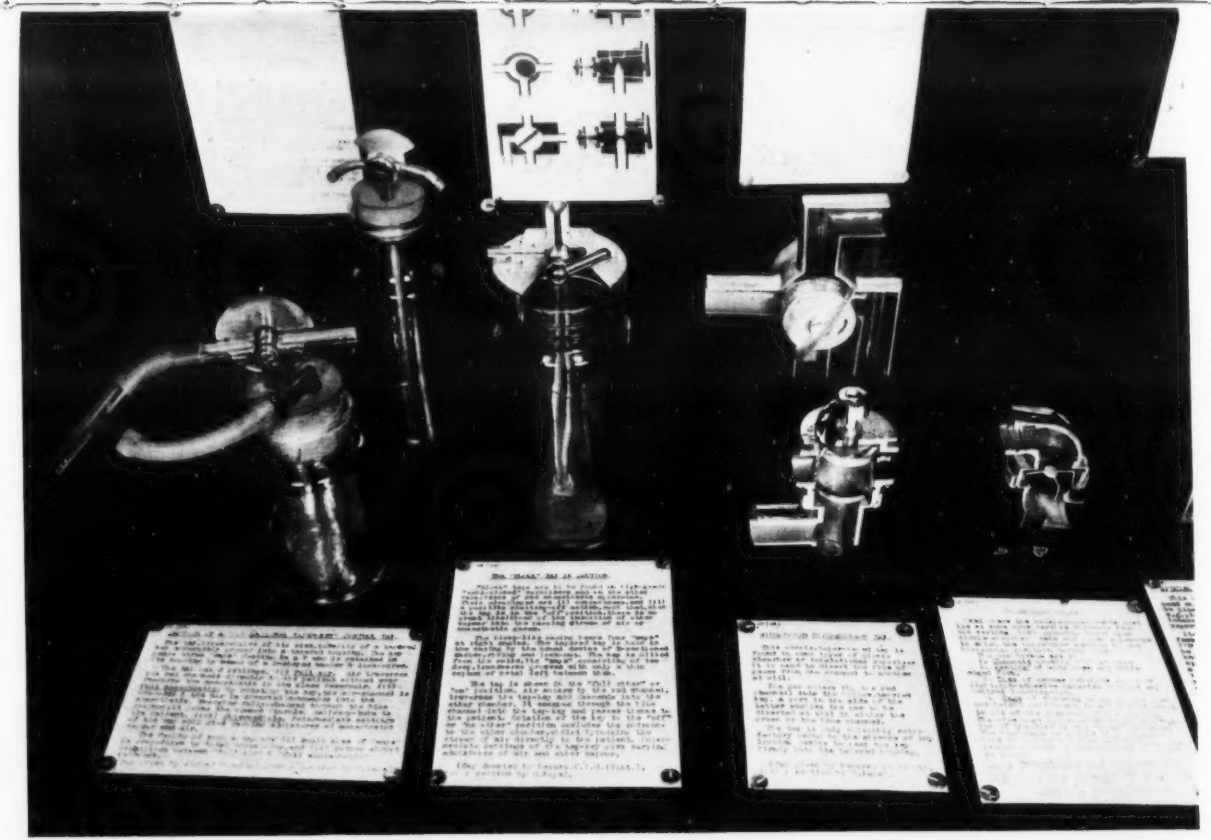
To provide scientific headquarters and a meeting place for the Society;

To foster post-graduate education in anæsthesia with particular attention to anæsthetists seeking senior qualifications;

To give basic training in anæsthesia to medical and dental students attending the University; and

To provide a liaison body between anæsthetists and manufacturers of anæsthetic drugs and appliances.

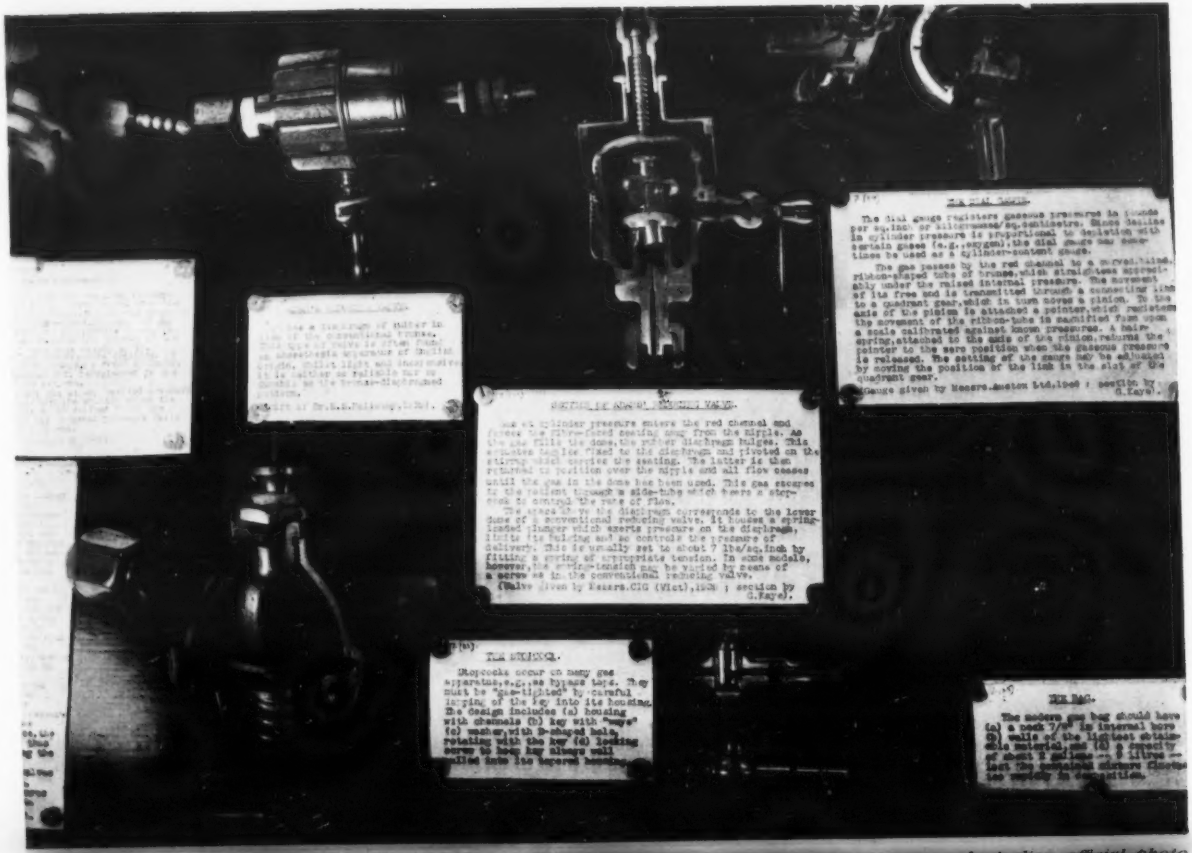
The decision to establish a museum of anæsthesia was made in 1939, but the outbreak of war caused the plans to be



Groups of sectional exhibits of modern control taps and valves. Each object is fully described and when necessary line drawings are employed.

L.B.

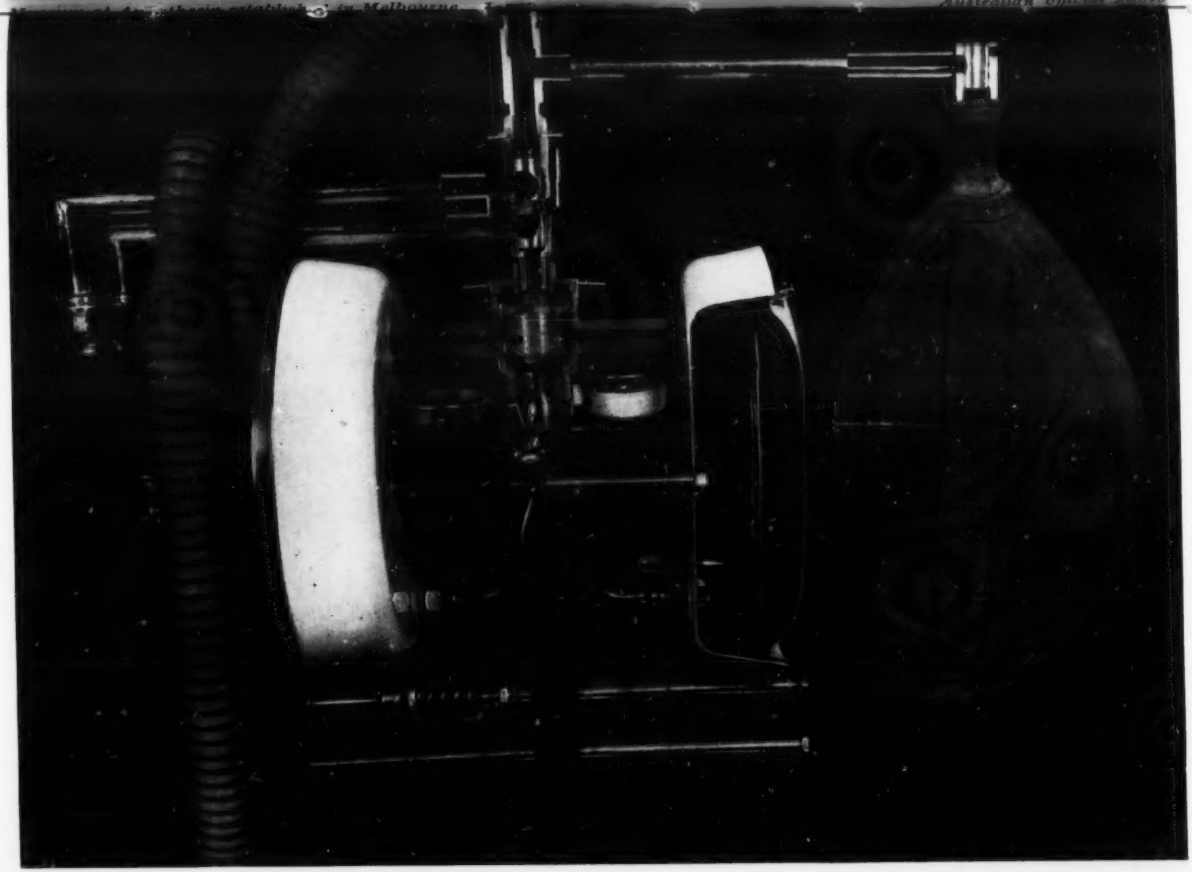
Museum of Anæsthesia established in Melbourne. L.924 *Australian official photo*


THE DIAL GAUGE.
The dial gauge registers gaseous pressures in pounds per sq.inch or kilogrammes/sq.centimetre. Since decline in cylinder pressure is proportional to deviation with certain gases (e.g., oxygen), the dial gauge may sometimes be used as a cylinder-content gauge.
The gas passes by the red channel to a curved, hollow, ribbon-shaped tube of bronze, which straightens appreciably under the raised internal pressure. The movement of its free end is transmitted through a connecting link to a quadrant gear, which in turn moves a pinion. To the axis of the pinion is attached a pointer, which registers the movement of the ribbon-tube in sacrificial form upon a scale calibrated against known pressures. A hair spring, attached to the axis of the pinion, returns the pointer to the zero position when the gaseous pressure is released. The setting of the gauge may be adjusted by moving the position of the link in the slot of the quadrant gear.
(Gauge given by Messrs. Aveton Ltd. Lond ; section by G. Kaye).
SECTION OF REDUCING PRESSURE VALVE.
Gas at cylinder pressure enters the red channel and passes the screw-faced seating away from the nipple. As the cone fills the dome, the rubber diaphragm bulges. This actuates the lever fixed to the diaphragm and pivoted on the stirrup and carries the seating. The latter is then returned to position over the nipple and all flow ceases until the gas in the dome has been used. This gas escapes by the valiant through a side-tube which bears a stop-cock to control the rate of flow.
The screw above the diaphragm corresponds to the lever screw of a conventional reducing valve. It houses a spring-loaded plunger which exerts pressure on the diaphragm, limits its bulging and so controls the pressure of delivery. This is usually set to about 7 lbs/sq.inch by fitting a spring of appropriate tension. In some models, however, the spring-tension may be varied by means of a screw as in the conventional reducing valve.
(Valve given by Messrs. CIG (West), Ltd. ; section by G. Kaye).
THE STIRRUP.
Stopcocks occur on many gas apparatus, e.g., as bypass taps. They must be "gas-tight" by careful forging of the key into its housing. The design includes (a) housing with channels (b) key with "eye" (c) washer with D-shaped hole, rotating with the key (d) locking screw to keep key always well pulled into its tapered housing.
THE BAG.
The anaesthetic bag should have (a) a neck 7/8" in internal bore (b) walls of the lightest obtainable material, but (c) a capacity of about 2 gallons - I illustrate the rubberised cotton cloth so widely in competition.

Reducing valves and their adjuncts are shown here in section and intact. These also are served with explanatory and critical notes.

L.B.

Australian official photo



This section model of a comparatively modern gas-anæsthesia apparatus illustrates the method used in the museum for preparing and displaying exhibits.

L.B.

Museum of Anæsthesia established in Melbourne. L.927

Australian official photo

suspended. In 1945 the Society started communicating with doctors, dentists, hospitals and manufacturers of instruments and drugs throughout Australia, requesting donations of suitable historical material. The prompt response to the Society's circulars resulted in generous and helpful gifts from all parts of the Commonwealth. Interesting exhibits of captured Italian and Vichy French instruments were also obtained from the Australian Army.

In addition the Society obtained material for its museum by exchange with the American Society of Anæsthetists and the Association of Anæsthetists of Great Britain and Ireland. The museum now possesses 1,000 exhibits.

Space for the museum was made available by the Melbourne University's Physiology School, and although it was not as large as desired it was the best obtainable owing to the current shortage of buildings in Australia.

The museum occupies two rooms with a total floor space of 400 square feet. One serves as an ante-room and office containing exhibits of large gas-oxygen apparatus, and current technical journals.

The Society's reference library containing some 130 books (exclusive of journals) is housed in the nearby Medical School library so as to obtain the advantage of the services of a full-time librarian.

Another satisfactory feature of the museum's location is its convenience to the laboratories of the Physiology School, which are open to members of the Society who wish to engage in research.

The main display is set in the second room and is grouped in three categories: historical, physiological and modern.

Owing to space limitations the designers were forced to build the main showcases to a height of 10 feet. A step ladder is available for visitors to the museum, however.

The two rooms of the museum connect with a spacious

lecture theatre capable of seating 200 persons, which is used by the Society of Anæsthetists for formal meetings. Its proximity to the museum allows lectures to be suitably illustrated by anæsthesia exhibits.

The " theatre " is suitable for film projecting and the Society extensively uses 35 mm. film strips and diapositives. It also possesses 16 mm. sound films but at present lacks the necessary projection equipment.

Control and organization of the museum is vested in an honorary curator, who is responsible to the executive of the Society. He possesses the qualifications specified by the Society for its curator.

He is a medical practitioner with an extensive knowledge of the theory and practice of anæsthesia, an understanding of engineering as applied to anæsthesia, acquaintance with clinical photography and draughtsmanship, and experience in medical lecturing.

Like many of his colleagues, he has an adequately equipped private machine-shop. He made exhibits unobtainable from outside sources.

The historical section of the museum is laid out in a large case measuring approximately 10 feet by 20 feet. It covers as far as possible the evolution of anæsthesia from 1846 to 1930.

Because medical equipment is usually metal-plated the exhibits are set against a black background, which shows them to the best advantage.

It was found that black paint absorbs light and increases discordant reflection so this was countered by the installation of internal tubular lamps set in metallic troughs which are burnished internally and blackened externally. They generate considerable heat, however, and to counteract the danger of fire and reduce consumption of power an individual switch and fuse has been fitted to each two shelves in every showcase.

The historical exhibits are arranged chronologically with a

shelf devoted to each agent of anæsthesia. An explanatory card attached to each exhibit gives its history and pharmacology. The apparatus for the administration of each particular agent is then presented as far as possible in year groups; for example 1850–1857, " cone inhalers for ether ", 1877–1907, " closed inhalers for ether ", and 1905–1940, " open methods with ether ".

The cards also explain the method of administration of each agent, the reasons for its introduction, its merits and defects, why it was superior to the methods which preceded it, and the cause of its subsequent discardment.

Where the design of an exhibit is complex, models are duplicated in section with structural components emphasized in colour.

Each exhibit (and the descriptive card which accompanies it) is marked with the shelf number and the serial number of the shelf.

A card index is provided and a visitor wishing to locate any particular piece of apparatus can compare the shelf number with the card index.

The primary aim of the modern section is to present the physiological basis of modern anæsthesia and apparatus of modern design acceptable to the standards committee of the Society. Where any particular piece of apparatus has been found to be ill-designed the fact is uncompromisingly stated on the explanatory card.

As anæsthesia is a highly technical subject the anæsthetist must be familiar with the combination of valves, flow meters, gauges and similar mechanisms into working apparatus, and every effort is being made to assemble a complete range of the standard types of these appliances.

These exhibits are also in section with emphasis placed on the scope of each item and the Society's opinion of it. In this way the anæsthetists or manufacturer of anæsthesia apparatus can see in a small space a wide range of modern equipment and gauge

from the explanatory cards the Society's opinion of their utility and constructional soundness.

The exhibits are treated in much the same manner as those in the historical section with the exception that a separate case is devoted where possible to each agent or method such as gas, endotracheal, intravenous, and preliminary medication.

As the physiological side of anæsthesia cannot be illustrated by exhibits of apparatus, this section of the museum is equipped with anatomical drawings and models, physiological diagrams and actual operation records.

In the museum, the Australian Society of Anæsthetists has achieved its aim of presenting the evolution and steady progress in knowledge of respiratory and circulatory physiology and of the anæsthetist's ability to control those functions during a surgical operation.

The Society has also demonstrated that a small group of enthusiastic technical workers can successfully establish a museum which can be educational while at the same time serving as a clearing-house for the exchange of ideas and information which are the basis of all scientific progress.

ABSTRACTS

" The effect of carbon dioxide inhalation in the prophylaxis of respiratory complications."

(G. H. Gadesby in *Anæsthesia,* January 1947, p. 12.)

The patients had all been subjects of bonegraft operations, mostly to some part of the face. Usually the necessary bone had been obtained from the iliac crest, thus causing " a great disturbance of the muscular activity employed in respiration, particularly coughing." The results of carbon dioxide therapy show reduction in total incidence of respiratory complications from 15 to 22 per cent, with possible reduction in their severity.

"Analgesia and Anæsthesia in Obstetrics." Anæsthesiology, March 1947, p. 113.

The combination of demerol and scopolamine is reported to be unsurpassed by other agents and combinations in present use. At Hartford Hospital the combination was given by the intravenous route and proved as satisfactory as barbiturate scopolamine medication.

CONSULTANTS FOR INDIA AND BURMA

The Secretary of State for India and for Burma has, in recognition of their valuable service as Consultants to G.H.Q., India, during the war, appointed the following gentlemen to be Honorary Consultants to the India and Burma Offices:

Brigadier S. M. Hepworth, M.B., Ch.B., D.M.R.E.—Consultant Radiologist

Brigadier G. W. Bamber, M.D., F.R.C.C.P.—Consultant Dermatologist

Brigadier E. E. Prebble, M.B., Ch.B.—Consultant Venereologist

Brigadier D. McAlpine, M.D., F.R.C.P.—Consultant Neurologist.

Brigadier E. A. Bennet, M.A., M.D., D.P.M.—Consultant Psychiatrist

Brigadier H. K. Ashworth, M.B., Ch.B., D.A.—Consultant Anæsthetist

Brigadier the Hon. G. F. O. Bridgeman, M.C., F.R.C.S.—Consultant Ophthalmologist

Brigadier Grant Massie, C.B.E., M.S., F.R.C.S.—Consultant Surgeon

Brigadier J. D. S. Cameron, C.B.E., M.D., F.R.C.P.—Consultant Physician

REVIEWS

Anæsthetic Methods. GEOFFREY KAYE with collaboration of R. H. ORTON and D. G. BENTON. pp. 706, illustrations and charts. Price 50*s.* (Australia). Barnsby (Surgical) Ptrs. Ltd., Melbourne, Australia, 1946.

This is a capital text book and in spite of war conditions appears to be most satisfactorily produced, but after all it is the matter more than the manner which is of most concern in a technical work, and for the matter there can be little but praise. After a chapter on history and theory of anæsthesia the author describes the effects on circulation and elimination, then the signs of anæsthesia and the estimation of risks. Here we think he might have laid more stress on the value of the breath-holding test, which is assuredly one of the most indicative—it is certainly the simplest of all these measures. Resuscitation is next dealt with, and we note that he does not mention the peculiar amnesic effects of some barbiturates, which may become, as we have ourselves seen, very important in legal affairs as for example when a contract is repudiated which was made by the patient while still under the influence of an anæsthetic. Later he may deny its validity, having completely forgotten committing himself while under barbituric influence.

Throughout the book we were particularly pleased by the full and accurate descriptions of apparatus; we do not recollect ever having seen this matter so well dealt with in a text-book. The book is called *Anæsthetic Methods*, but it is much more than this, for the physiology and the pharmacology of the subsequent results of various forms of anæsthesia are all fully considered. After spinal analgesia, blood transfusion, fires and explosions are carefully described.

The volume is completed by a chapter on death under

anæsthesia and one by D. M. Selby, Barrister-at-Law, for the Anæsthetist and Australian Law, and by discussion of recently introduced methods, including the use of curare. Equipment for private practice is discussed in the appendix and some "useful data". There is in addition a good bibliography.

The Development of Inhalation Anæsthesia. BARBARA M. DUNCUM. pp. 640, illustrated, 35*s.* net. Oxford University Press.

Dr. Duncum's introductory chapter alone is a capital epitome of the history of anæsthesia by inhalation. Passing on to the main portions of the book she starts with an account of the unconsciously preparatory work of Humphry Davy, Levoisier and Beddoes. We say unconsciously because although Humphry Davy certainly threw out the suggestion that nitrous oxide gas might be used to prevent the pain of operation, no one followed up his idea and he himself was concerned with the chemistry and physics, not with the medical application of his researches.

Priestley's work on oxygen then comes into the picture and the subsequent extended practice of pneumatic medicine. Ether vapour was being used therapeutically in 1796. Chapter II deals with Hickman, Long and Wells; Chapter III with Morton and etherization. Then comes the advent of chloroform and Simpson's work at Waldie's suggestion, and Snow's great work in putting the administration of chloroform on a scientific basis, with definite percentages of the vapour. Dr. Duncum in her account of chloroform in practice pays much attention to its use in France in the 1850's. Then comes an account of the chloroform committees in 1864. Part IV deals with the revived use of nitrous oxide and ether. This was actually started by Colton of America in his dental practice. In 1867 he demonstrated his method in Paris, where a great international exhibition was in progress. Evans, a leading American dentist in that city, learned

from Colton how to make and administer nitrous oxide gas. He came to London and gave demonstrations at the National Dental Hospital, Moorfields, and elsewhere. Nitrous oxide was firmly established as the best anæsthetic for dental work. Ether came to London in 1872 with Jeffries, an American ophthalmologist, who demonstrated its administration at St. George's Hospital and elsewhere. It rapidly grew in favour and this was increased by Clover's ingenious apparatus for giving it. Ormsby's inhaler, too, found many adherents especially for maintaining anæsthesia after this has been completely induced by the gradual method made possible by Clover. Between 1878 and 1885 most important contributions to the knowledge of anæsthesia and the principles by which is should be practised were made by Paul Bert. Premedication with morphine came in about 1864, sponsored chiefly by Claude Bernard and by Nussbaum.

Later chapters deal with the trial of ether by continental countries, the Hyderabad Commission, and anæsthetic trends in England, 1890–1900. A curious omission in this excellent and otherwise comprehensive book is any account of Magill's work on endotracheal anæsthesia.

A Synopsis of Anæsthesia. J. A. Zee, M.R.C.S., D.A. pp. 254, 42 illustrations, 12*s.* 6*d.* net. John Wright and Sons, Bristol.

The book starts with a synopsis of the history of anæsthesia under the names of those chiefly concerned in making it, from Priestley and Humphry Davy to Clover. Then follows a list of the important dates. Next comes a chapter on respiration, with illustrations of the parts concerned. Pre-anæsthetic care and preparation and premedication are then dealt with. The methods of inhalation anæsthesia are then briefly described and the stages and signs of anæsthesia. The technique and agents for inhalation anæsthesia occupy succeeding chapters. Types of apparatus and methods of administration are then described.

The accidents of anæsthesia and their treatment are briefly

considered and this is followed by an account of the gases used in anæsthesia. Endotracheal administration follows and after this rectal anæsthesia and basal narcosis with a brief contribution on rectal anatomy. Intravenous anæsthesia and the barbiturates occupy following pages, then analeptics and spinal analgesia; complications and sequelæ of anæsthesia, another. Anæsthesia and analgesia in labour provide material for the concluding chapter. We can cordially recommend the book as a sound and useful summary of anæsthetic practice.

The Chemistry of Anæsthesia. JOHN ADRIANI, M.D. pp. 530, illustrations and diagrams. Blackwell Ltd., Scientific Publications, Oxford, 1946.

This excellent and comprehensive work is divided into three parts: inorganic chemistry related to anæsthesia, organic chemistry related to anæsthesia, and biochemistry related to anæsthesia. Actually it deals also with the physical laws of gases, which are explained and exemplified. Flowmeters, too, are illustrated and described in detail. The diffusion of gases through rubber is discussed, and the physical methods of analysis of gases in body fluids and tissues. "The distension of the bowel in intestinal obstruction is due almost entirely to accumulation of nitrogen within the lumen." Inhalation of 100 per cent oxygen through a semi-closed system establishes a gradient for nitrogen from tissues to blood, to alveoli, to outside air. The gas is gradually eliminated from tissues and replaced by oxygen. The use of an inert gas lighter than nitrogen is often desired as a diluent for oxygen in patients with an obstructed airway anywhere between the lips and the alveoli. Helium is then of value, diffusing faster in and out of bronchi and alveoli and lessening the effort of ventilation.

Dealing with CO_2 absorption methods the author points out the importance of the hardness and size of the soda lime granules employed. The best canister is of 8 cm. diameter, 13

cm. long, with a volume of 650 c.c., and accommodates 500 grams 4 × 8 meth. soda lime pellets.

The Common Cold. Noah D. Fabricourt, M.D. pp. 123. Macdonald and Co. Ltd., London.

At first the anatomy of the upper air passages is described and its functions in avoiding or accepting a cold explained. The author has no new theory of causation and accepts the usually acknowledged virus and associated bacteria. He attributes much importance to the weather and does not believe in the efficacy of habitual cold baths as a preventive. Allergy and dyspnœa are considered, and the complications of the common cold. For treatment he relies on the old and well-tried advice, "Get into bed and stay there". He advocates the humidifying at the same time as the heating of the air of rooms. The good effect of treating air with glycol is stated and the advantage of germicidal lamps.

The Conquest of Cancer. George Bankoff, M.D., F.R.C.S. pp. 187, illustrated. 6*s*. net. Macdonald and Co. Ltd., London.

This is a good book for the lay reader. It states in simple language the known facts about cancer and the surgical treatment of the disease and it is more optimistic than depressing. Some of the author's statements however lack proof, as when he says that "the less condiments and spices one uses the less opportunity for cancer", and that "spectacles, artificial teeth and glass eyes may act as irritants and cause the possible development of cancer" and that "policemen get cancer of the bronchial tubes and lungs through irritant fumes inhaled". He speaks of "fibrins, benign tumours which have their origin in connected tissue"; is this a commonly accepted term for benign tumours? Speaking of cancer of the stomach he says "the pyloric contraction is due to secondary anaemia", surely it is the other way about!

CORRESPONDENCE

Sir,—I have just spent some considerable time reading Dr. K. E. Madan's paper, " Spinal Analgesia with Sacral Escape ", in the current number of the *British Journal of Anæsthesia*. I say " considerable " because it appeared confused in composition and doubtful in validity. Perhaps I may explain by reference to points in the order in which they occur therein.

1. *Lines* 15–17, *p.* 95. The author describes the effect on the spinal micturition centre as being " more pronounced " when drugs " like Stovaine, Amæthaine with 10 per cent glucose, heavy Nupercaine " are used, " particularly if . . . alcohol has been used to lighten the specific gravity ".

Does he mean to imply that he sometimes " lightens " his hyperbaric solutions by adding alcohol or is he referring to those manufactured *hypo*baric preparations which do contain alcohol? In the latter case, presumably the conjunction at the end of line 16 should read " or " instead of " and ".

2. *Line* 25, *p.* 96. Presumably the word " of " should read " or " and this is a typographical error.

3. *Diagram* I, *p.* 97. Having checked my first impressions by reference to both Gray's *Anatomy* and Samson Wright's *Physiology*, I still consider this to be a confused picture.

(*a*) The pelvic nerve or *Nervus Erigens* (" Nervi Erigentis " is neither English nor Latin!) comprises the parasympathetic fibres arising from the sacral outflow of the parasympathetic system from S. 2, 3 and 4 and *not* as here depicted, the sympathetic fibres from L. 1, 2 and 3.

(*b*) These fibres travel in the Pudendal Nerve (in the diagram referred to as the " Prudental Nerve "—perhaps another imprudent misprint!) and innervate *not only the* External Sphincter but the bladder itself and constitute the " emptying nerve " referred to in the diagram. Also, they traverse the Vesical Plexus which is not only supplied with lumbar fibres as implied by the diagram.

4. *Line* 2, *p.* 98. " hemi-lateral " is an ambiguous word. Literally it means " half of a side " which is not the same thing as unilateral, meaning " one side only ". Thereafter the author refers only to unilateral analgesia and one can only deduce that he meant hemi-lateral to be a synonym for it.

5. *Para.* 2, *p.* 98. If a patient who has had a hypobaric injection is turned on to his back and his thighs are " kept well flexed for another 3 minutes " the hypobaric solution is thereby *invited* to float up into the " sacral concavity " and it is difficult to see how his sacral motor roots will escape the effect of the drug since they are now higher than the lumbar roots which are the target of the manœuvre. If, in Dr. Maden's experience, the sacral roots do, in fact, escape with this method, it can only mean that all the drug has been " fixed " in the first 3 minutes and the patient might as well have relaxed his thighs.

6. *Para.* 3, *p.* 98. By definition in all reputable text-books of anatomy, that part of the body " above the diaphragm " is the thorax and the only operations thereon must be thoracic and cannot be " abdominal ".

It is also assumed that, in line 6 of this paragraph, " to " should read " from " and that what the author is really considering are upper abdominal operations close to but still below the diaphragm.

7. *Line* 2, *p.* 99. Having only described his techniques with heavy and light solutions, the author here claims to be equally successful with " isobaric solutions ". Try as I may, I can only conceive of isobaric solutions either " staying put " or diffusing equally in all directions completely irrespective of the patient's posture. I know of no commercial preparation of an isobaric analgesic solution and have always assumed that this was because one would have no control of its diffusion within the theca.

8. *Conclusion* 1, *p.* 99. I am not clear whether Dr. Maden postulates a " sacral centre of micturition " *within* the spinal cord or in either the hypogastric, vesical or presacral plexuses. My own conception of it is as being *within* the lumbo-sacral cord in which case it is not " innervated *by* " the sacral nerves but is the origin *of* them.

You must forgive me, Sir, for this long discourse on one article in your Journal. While some of my criticisms are of the care which Dr. Maden bestowed on his paper, others may prove to

be only of the meticulousness of your proof-readers. Since the other papers in the same number and previous issues of the Journal have not carried so many errors I feel that the former may be the case and so you may care to refer my comments to him.

I am led to make these comments, pedantic though some may appear to be, because I think that on all specialities—our own perhaps most of all—too much is written and published which is of too poor quality. All too frequently the substance of a paper is not sufficiently worth-while, its " findings " are not statistically significant or its composition as a piece of English prose is unworthy of a graduate in what should still be able to command respect as a learned profession.

I feel that these considerations should apply especially to a specialist journal of infrequent publication and limited paper space.

I therefore hope these criticisms will be accepted in the constructive mood in which they are offered.

DONALD V. BATEMAN, M.B., B.Chir.

OBITUARY

DR. SAMUEL JOHNSTON OF TORONTO

DR. SAMUEL JOHNSTON died suddenly at his home in Toronto on April 14th last following a coronary occlusion. He was seventy-eight years of age and had been retired from active practice for several years. A few weeks prior to his death he had undergone a major operation from which he appeared to be convalescing in a satisfactory manner, the symptoms of cardiac derangement arising suddenly and without warning. Until the time of this illness he had been in his usual good health and spirits, his sudden passing coming therefore as a shock to his many friends. His wife, Margaret MacCallum Johnston, survives him.

After a few years devoted to a business career Dr. Johnston entered Trinity College at Toronto in 1897, from which he graduated in the remarkably short space of four years with the degrees M.A., M.D., C.M. Following graduation he entered the Toronto General Hospital as an interne. In those days the administration of anæsthetics was all too commonly placed in the hands of the resident staff and in Dr. Johnston's case it became apparent early that this young physician, in addition to being particularly interested in anæsthesia, showed unusual ability in this field.

From the beginning of his career in practice his activities were directed mainly to anæsthesia. He was named chief of the new departments of anæsthesia established in 1907, mainly through his efforts, in the University of Toronto and the Toronto General Hospital, posts which he held with distinction until the year 1935. In 1910 he visited clinics in England and France. During his stay in London he spent some time anæsthetizing animals for experimental investigations then being undertaken by Sir Victor Horsley.

Dr. Johnston foresaw that anæsthesia was a science which would hold an increasingly important position among hospital services. It is to his credit that early in his career he bent his energies towards interesting his students and internes in this branch of medical practice and encouraging them to adopt it as their life's work. He added to his staff as the times permitted, giving unstinted support and encouragement to his associates and indeed to all anæsthetists with whom he came in contact. He made every effort to keep his department abreast of the times. In the years following the First World War, particularly, he missed few important scientific meetings of anæsthetists in America. He was an outstanding figure on these occasions, with few of his contemporaries either in Canada or the United States able to speak with equal authority. Those of us following in his footsteps in those years remember with pride his contributions

at these sessions. When a subject of a controversial nature was in review his opinion, if not voluntarily expressed, was requested either from the chair or from the floor. His own outstanding ability as an anæsthetist and the enthusiasm he was able to instil in the members of his own and similar departments in other Canadian hospitals did much toward laying the foundations for the establishment of anæsthesia in Canada as an important medical science and speciality. While his reputation was international in scope, for many years he has been called the dean of Canadian anæsthesia, a tribute which he richly deserved.

Many honours fell to Dr. Johnston during his lifetime. He was the first president of the Canadian Society of Anæsthetists and a past president of the Associated Anæsthetists of the United States and Canada. He was chairman for one session at the meeting of the section of anæsthesia of the British Medical Association at Nottingham in 1926. The American College of Physicians honoured him by making him a Fellow. He was a Charter member and a past president of the Toronto Academy of Medicine. He served a term as president of his dinner club, the Æsculapian Society. He was a member of the Westminster Central United Church and of the Rotary and Empire Clubs of Toronto.

Dr. " Sam " had many staunch friends in all walks of life and to these his home was ever open. He and his charming wife were the kindliest of hosts. Visiting anæsthetists particularly felt the warmth of their hospitality: in many lands there are some who will feel that they have lost a friend.

" His life was gentle and the elements so mixed in him, that Nature might stand up and say to all the world ' This was a man '." These words of Shakespeare seem so particularly applicable to Dr. Samuel Johnston.

HARRY SHIELDS

[Dr. Johnston's successor—ED.]